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THE DIRECTV GROUP INC
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P O BOX 956
EL SEGUNDO, CA 90245-0956

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 19

Application Number: 09/497,865
Filing Date: February 04, 2000
Appellant(s): CHANG ET AL.

Vijayalakshmi D. Duraiswamy
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 10/02/02.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

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(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed. However, an IDS was filed 2/26/04. Attached with this Brief is a copy of the initialed IDS.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is substantially correct. The changes are as follows: the issue is whether claims 1, 4, 5, 7-9, 11, 13-18, 21, 22 and 25-37 are patentable under 35 U.S.C. 103 (a) over Karlsson et al in view of Chiba et al, Chang et al and Aoki. Additionally, the second issue is whether claims 2, 3, 10, 12, 19, 20 and 23-24 are patentable under 35 U.S.C. 103 (a) over Karlsson et al in view of Chiba et al, Chang et al and Aoki as set forth above and further in view of Ajioka and Barrett et al.

(7) Grouping of Claims

Appellant's brief includes a statement that the dependent claims do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

A substantially correct copy of appealed claims appears on pages 14-20 of the Appendix to the appellant's brief. The minor errors are as follows: on page 19, line 5 (claim 30), it should read " forming a plurality <u>of</u> electrical waveguide signals."

(9) Prior Art of Record

6,034,634	KARLSSON et al	3-2000
5,973,647	BARRETT et al	10-1999
5,257,030	AOKI et al	10-1993
5,077,562	CHANG et al	12-1991
3,720,953	AJIOKA	3-1973

CHIBA, Isamu et al, "Digital Beam Forming (DBF) Antenna System for Mobile Communications," IEEE AES Systems Magazine, Sept. 1997, pp. 31-41.

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 4, 5, 7-9, 11, 13-18, 21-22 and 25-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Karlsson et al in view of Chiba et al, Chang et al and Aoki et al.

Karlsson et al teach the use of a satellite terminal antenna that combines mechanical scanning in the azimuth direction and electronic one-dimensional scanning in the elevation direction wherein the antenna is rotated mechanically such that multiple satellites are within the elevation scanning plane of the antenna (Figures 1 and 6). Multiple beams are taught and shown for the purpose of simultaneously tracking the multiple satellites for providing soft handover (Figure 5 and col. 5, lines 49-54). Karlsson et al differ from the claimed subject matter since the claimed digital beam former is not specified; Karlsson et al describe a satellite communication antenna comprised of a phased array antenna including the claimed limitations of the preamble, rotating plate and plural radiation elements. Also, it is the appellants' belief that Karlsson et al do not show a retrodirective antenna, although the claim language merely reads "so that the corresponding element/waveguide can be used for transmission."

The progress in digital device technologies has led to the use of DBF antennas for use in commercial communication system, most suitably, mobile radio systems, as taught by Chiba et al (see "Introduction", e.g.). The advantageous features of DBF for use in phased array antennas as a replacement for analog beam forming are clearly identified therein, and thus, Chiba et al provide a clear motivation to substitute digital beam forming for analog beamforming. Chang et al describe a specific

digital beam forming technique that is efficient and utilizes fewer ADCs than conventional digital beam formers, resulting in lower power requirements, weight, complexity and cost, which provides motivation to use Chang's et al DBF. Figure 2 of Chang et al exemplifies the technique, including the claimed coding circuitry (170 and 152/164/166/168) for coupling a respective code to a respective one of the antenna element signals; the claimed "multiplexer" (180, 184) for consolidating the coded element signals (182/184/186/188) into an analog bit stream; the claimed "analog to digital converter" (198, 200) for converting the analog bit stream into a digital bit stream; and the claimed "circuitry for forming multiple digital beams" 130. A digital receiver is inherent, while the determination of the strongest signal is clearly an obvious, and oldest, technique for locking on to a desired signal. Aoki et al teach an antenna system having digital processing wherein it is taught to transmit radio waves in the same direction as the direction of arrival of the incoming radio waves, providing retrodirective features, as would be desired in any communication system, even if the transmitting and receiving frequencies are different. Furthermore, Aoki et al teach the digital processing system including receiving the signals on plural elements, digitizing the signals and a processor that detects the direction of arrival of the maximum intensity among the intensities of incoming radio waves arriving in all directions which are detected by an FFT circuit (col. 3, line 37 - col. 4, line 28).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Karlsson et al by substituting a digital beam former for the electronically scanned antenna beams in view of the progress in such direction in the art as shown by Chiba et al for the reasons set forth above. Moreover, it would have been further obvious to one having ordinary skill in the art to modify the digital beam former by using the DBF technique expressed by Chang et al so as to provide a lightweight and less costly device for a user terminal. Lastly, it would have been obvious to one having ordinary skill in the art to use processing that detects arrival direction from the maximum received intensity signal and transmit back in such direction in view of the teachings of Aoki et al so as to provide a retrodirective feature in a communication system and thereby increase the communication channel capabilities. The combination of references make obvious the claimed subject matter wherein the specifics of the claimed

digital beam former are explicitly shown by the Chang et al reference. The dependent features are either shown or made obvious by the combination of references.

Claims 2, 3, 10, 12, 19, 20 and 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined prior art set forth above as applied to claims above, and further in view of Ajioka and Barrett et al.

Karlsson et al in view of Chiba et al, Chang et al and Aoki et al teach a satellite communication terminal having mechanical azimuth scanning and electronic elevation scanning using digital beam forming techniques that allow for soft handover as set forth above. The combined prior art fails to specify the electronically scanned antenna array as comprising cross-slotted waveguides, each including a septum. Ajioka teach the conventionality of a cross-slotted waveguide having a septum for use in a phased array antenna. Barrett et al teach the conventionality of a slotted antenna array for use in a satellite communication terminal wherein azimuth scanning can be achieved mechanically and elevation scanning can be achieved electronically. In view of the conventionality of cross-slotted waveguides in scanning antenna arrays as shown by each of Ajioika and Barrett et al, it would have been obvious to one having ordinary skill in the art to modify the scanning antenna arrays of Karlsson et al by substituting a cross-slotted waveguide array. Ajioka further shows the use of a septum for controlling characteristics of the antenna output.

(11) Response to Argument

Firstly, it is noted that the appellants continue to misconstrue the rejection. Contrary to the appellants' belief, the rejection stands as Karlsson et al in view of Chiba et al, Chang et al and Aoki et al and not as appellants expressed Karlsson et al in view of either one of Chiba et al, Chang and Aoki. The majority of the appellants' arguments are thus not directed to the combination of references but merely to the combination of Karlsson et al with each of the separate secondary references or each of the references alone. Thus, the arguments (1) that Karlsson et al do not teach the use of a digital beamformer, multiplexer, A/D converter, coding circuitry and retrodirective aspects, (2) that Chiba et al do not teach retrodirectivity or coding, (3) that Chang et al do not teach coding for retrodirectivity, (4) that Aoki et al is directed to a fixed antenna not using a rotating plate and does not teach coding, and (5) that

Chang et al and Aoki et al both fail to teach locking onto a strongest signal having a corresponding element so that the element can be used for transmission are not germane since they are not directed to the rejection with respect to the combination of references. In response to appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The Appellants have failed to provide any evidence of record to show that the combination of references fails to suggest the claimed subject matter as set forth in the rejection. The combination as a whole is deemed to make obvious the claimed invention. Each of the references is directed to the field of the invention, which is a communication antenna terminal. Moreover, the rejection clearly sets forth motivations to combine each of the references which motivations are suggested by the references themselves. The combination of Karlsson et al with Chiba et al and Chang et al makes obvious the substitution of the particulars of the digital beamforming circuit of Chang et al wherein the circuit of Chang et al shows the claimed coding circuitry, multiplexer, ADC and circuitry for forming multiple beams. A receiver is inherent in each and every one of the satellite communication antenna systems. The further addition of the teachings of Aoki et al make obvious the retrodirective properties desired in a communication system so as to direct the transmission in the same direction as the arrival direction of a signal. The claim language "so that the corresponding element can be used for transmission" is met on several levels. Firstly, each or all of the elements *can be used* for transmission, thus the language fails to provide any distinguishing feature since any/all corresponding element(s) including the element receiving the strongest signal can be used for transmission and would be used in the event that all of the elements are generating the transmission beam. Secondly, the combination of references suggests determining the direction of arrival of all signals, including the strongest signal. The element receiving the strongest signal obviously would be part of the elements transmitting back in the same direction as the received direction. Applicants allege novelty of the use of retrodirectivity utilizing the claimed digital beamforming device arguing that none of the references suggest retrodirectivity. This is not persuasive since Aoki et al is cited specifically for such feature. Additionally, each of the references is directed to a communication system using an antenna

array having some form of scanning multiple beams. Several teach adaptive arrays. In any communication system utilizing directional antenna beams between a first transceiver and a second transceiver, it is obvious if not inherent to utilize received information of the beam as an aid to directing a return response in the direction of the received signal. Thus, every directional communication antenna is effectively retrodirective, that is, using the direction of arrival of a received signal to transmit a signal in the same direction. Every antenna element is reciprocal, thus, each and every antenna element "can be used for transmission". Additionally, Chiba et al disclose the use of digital beamforming for providing multiple beams covering an area and selecting the beam with the maximum receiving power; then, in a mobile satellite communication, the satellite signal is captured. Adaptive arrays have the inherent feature of placing nulls in the directions of interferences as well as one or more main lobes in the directions of desired targets. In view of the fact that Chiba et al, as well as all of the other references, are directed to a communication system, transmission and reception are inherent. The specific embodiment shown in Aoki is non-limiting; thus, the appellants' allegation that due to the antenna being fixed in Aoki as opposed to rotating as in the claims, there would be no suggestion to use is not persuasive since the concept of retrodirectivity is clearly suggested and utilized for the sake of improving communications.

Appellants separately argue each of the dependent claims with a statement including a portion of the claim language as well as a statement that the references fail to suggest such. As the Office has set forth a prima facie case of obviousness, it is incumbent upon the Appellant to show how the prior art references in combination fail to meet the claim limitations. The Appellants' arguments amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the combined references. Appellants have not provided any facts to support that the combination of references do not suggest the claimed features but merely alleges that the features are not suggested in combination with the recitations of the independent claim. Since the appellants have failed to provide any facts to support their allegations for patentability, only a few of the arguments are addressed merely to contradict the appellants' allegations. For example, appellants allege that forming beams using FFT techniques (cls. 4/8/15) are not suggested; however, at least Aoki et al (col. 3, line 37 – col. 4, line 28) and Chiba et al (Fig. 14) show this. Appellants allege that

use of the antenna on a mobile vehicle (cl. 5) is not shown; however, at least Karlsson et al teach use of satellite communications using mobile stations (col. 2 line 53-61), a mobile station clearly making obvious use on a vehicle, i.e. a mobile station. Appellants allege the failure of transmitting multiple digital beams to a plurality of satellites in the equatorial satellite constellation; however, Karlsson et al suggest this (col. 1, lines 22- 51 and col. 5, lines 50-54) while the DBF of Chiba et al synthesizes 16 multibeams for use in satellite communications. Appellants allege the failure of the prior art to suggest generally circular rotating plate yet rotating plate 12 of Karlsson is clearly shown as circular and rotating 24. Thus, appellants' arguments for each claim standing or falling on its own is not persuasive.

With respect to the second issue, the appellants argue that claims rejected further in view of Ajioka and Barrett et al are dependent upon independent claims addressed above and as such the arguments are equally applied thereto. However, as noted above, the independent claims are not deemed patentable for reasons previously set forth. Appellants allegations that Ajioka does not teach beamforming on the retrodirective aspects of the claims and the coding circuitry are not germane to the rejection since these elements are taught by the previous combination of references. Ajioka and Barrett et al are cited for the suggestion to use slotted waveguides as antenna elements and not for the reasons set forth by the appellants. The mere allegation that the dependent features in association with the recitations of the independent claims are not shown is not convincing since the references disclose parallel arrays of cross-slotted antenna elements, see Figure 2 of each, and use of a septum 50 in Ajioka.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,
Gregory C. Issing
Primary Examiner
Art Unit 3662

gci
June 23, 2004

Conferees
TT THOMAS TARCZA
TB THOMAS BLACK

THE DIRECTV GROUP INC
PATENT DOCKET ADMINISTRATION RE/R11/A109
P O BOX 956
EL SEGUNDO, CA 90245-0956